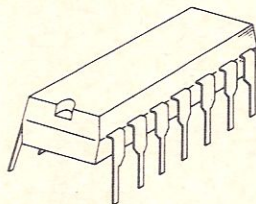
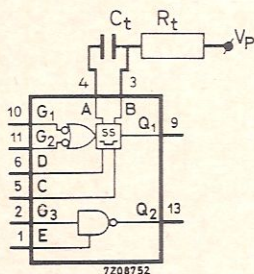


The FC family of DTL silicon monolithic integrated circuits is designed for medium speed digital equipment in computing, telecommunication, instrumentation and industrial control.

## MONOSTABLE MULTIVIBRATOR



### QUICK REFERENCE DATA

|                                                                 |                    |                   |
|-----------------------------------------------------------------|--------------------|-------------------|
| Supply voltage                                                  | $V_P$              | $6.0 \pm 5\%$ V   |
| Operating ambient temperature range                             | $T_{amb}$          | 0 to 75 °C        |
| Output pulse width                                              | $t_{Q1L}, t_{Q2H}$ | 100 ns to 1 s     |
| Max. operating frequency; $T_{amb} = 25\text{ °C}$              | $f_c$              | min. 2.5 MHz      |
| Fall propagation delay time; $T_{amb} = 25\text{ °C}$           | $t_{pdf}$          | typ. 75 ns        |
| Available d.c. fan-out to FCH gates<br>(full temperature range) | $N_a$              | min. 8            |
| D.C. noise margin; $T_{amb} = 25\text{ °C}$                     | $M_L$              | min. 0.6 V        |
| Power consumption<br>50% duty cycle; $T_{amb} = 25\text{ °C}$   | $P_{av}$           | typ. 110 mW       |
| Package                                                         |                    | D1 (Dual in-line) |

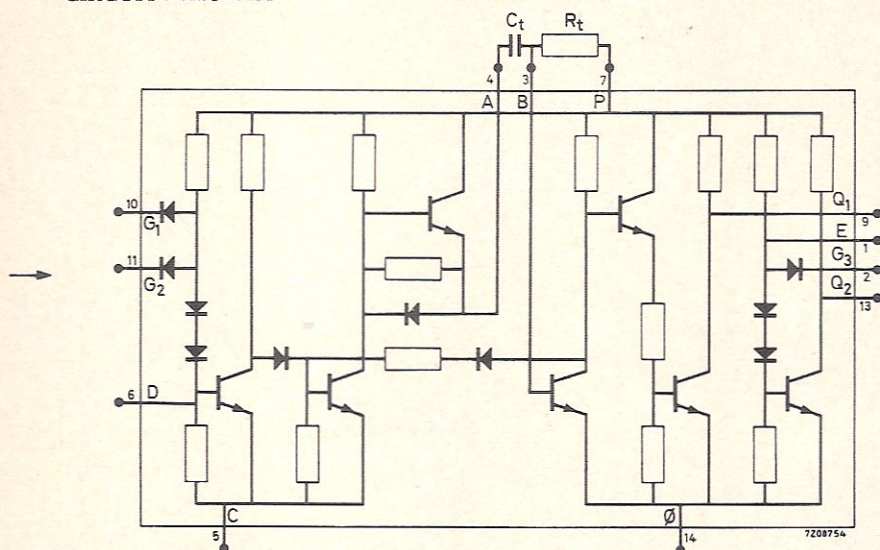
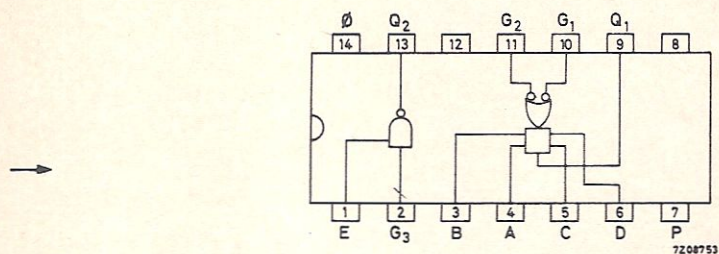
The FCK101 combines a threshold triggered monostable circuit (single-shot) and an inverter, providing both negative and positive going output pulses whose width is adjustable (by external resistor and capacitor) over a very wide range. It is particularly recommended for standardizing pulses of random waveforms such as in clock circuits, and for generating time delayed pulses. The inverter can be used independently. The FCK101 is compatible with the other circuits of the FC family.

**FCK 101**

(Monostable)

**FC family**

standard temperature range

**CIRCUIT DIAGRAM****TERMINAL CONNECTIONS (top view)**

## INTRODUCTION TO THE CHARACTERISTICS

### 1. General assumptions

- All voltages are assumed to be measured with respect to the common supply return and reference terminal, designated by  $\emptyset$ .
- A current is taken as positive when its conventional direction of flow is into the device.
- Where no electrical conditions are specified for a given terminal, it is left unconnected.
- Conditions such as "Input  $V_{QLmax}$ " are to be understood as follows: for each temperature, the maximum value of the voltage  $V_{QL}$  is applied to the input.
- Number indices (1, 2, 3) for terminals G and Q are omitted where confusion cannot arise, or where specified values apply equally to any one of them.
- Legend: M = monostable multivibrator  
I = inverter  
M, I = applies equally to M and I  
M+I = M and I combined, Q<sub>1</sub> and G<sub>3</sub> interconnected  
H = HIGH state (the more positive signal voltage)  
L = LOW state (the less positive signal voltage)
- Terminal C is connected with  $\emptyset$ .

### 2. Static data

For M, static data in the non-quiescent state apply to the moment immediately after the transition, with  $R_t = 10 \text{ k}\Omega$  and  $20 \text{ pF} < C_t < 160 \text{ }\mu\text{F}$ .

### 3. Input threshold voltage levels $V_{GL}$ and $V_{GH}$ . Output current $I_{QL}$ .

At input voltages equal to the threshold voltage levels  $V_{GL}$  and  $V_{GH}$ , the circuit is near the limit of switching.  $I_{QL}$  is the value of LOW state output current at and below which  $V_Q$  will not exceed  $V_{QLmax}$ .

$V_{GL}$ ,  $V_{GH}$  and  $I_{QL}$  are defined as being independent of any condition except temperature, thus forming the basis of the other circuit variables.

### 4. Fan-out and noise margins

Available fan-out and noise margins as specified under quoted conditions represent guaranteed limit values applicable to the entire supply voltage range of 5.7 to 6.3 V (the noise margins at any loading between  $N=1$  and  $N=N_a$ ), provided that:

- driving and driven circuits are operating at the same ambient temperature and the same supply voltage;
- in the LOW state, the sum of the diode leakage currents through inputs other than those driven directly by the circuit concerned, may be neglected.

**FCK101**

(Monostable)

**FC family**

standard temperature range

→ **CHARACTERISTICS** (pin C connected with pin  $\emptyset$ )

|                                       | M/I                                    | Electrical conditions                                                       |                    |                                            |                                                                              | Tamb (°C)                                  |                                             |                                             |                                                        |
|---------------------------------------|----------------------------------------|-----------------------------------------------------------------------------|--------------------|--------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------|---------------------------------------------|--------------------------------------------------------|
|                                       |                                        | input<br>G                                                                  | output<br>Q        | supply<br>P (V)                            |                                                                              | 0                                          | 25                                          | 75                                          |                                                        |
| <u>STATIC DATA</u>                    |                                        |                                                                             |                    |                                            |                                                                              |                                            |                                             |                                             |                                                        |
| <u>Input threshold voltage levels</u> |                                        |                                                                             |                    |                                            |                                                                              |                                            |                                             |                                             |                                                        |
| - input LOW                           | M, I                                   | -                                                                           | -                  | 5.7 to 6.3                                 | V <sub>GL</sub>                                                              | 1.0                                        | 1.0                                         | 0.8                                         | V                                                      |
| - input HIGH                          | M, I                                   | -                                                                           | -                  | 5.7 to 6.3                                 | V <sub>GH</sub>                                                              | 2.3                                        | 2.2                                         | 2.1                                         | V                                                      |
| <u>Output voltage levels</u>          |                                        |                                                                             |                    |                                            |                                                                              |                                            |                                             |                                             |                                                        |
| - output LOW                          | $\begin{Bmatrix} M \\ I \end{Bmatrix}$ | V <sub>GL</sub><br>V <sub>GH</sub>                                          | I <sub>QL</sub>    | 5.7                                        | V <sub>QL</sub> max.                                                         | 0.4                                        | 0.4                                         | 0.4                                         | V                                                      |
| - output HIGH, unloaded               | $\begin{Bmatrix} M \\ I \end{Bmatrix}$ | V <sub>GH</sub><br>V <sub>GL</sub>                                          | I <sub>Q</sub> = 0 | 5.7                                        | V <sub>QH</sub> min.                                                         | 5.3                                        | 5.3                                         | 5.3                                         | V                                                      |
| <u>Output currents</u>                |                                        |                                                                             |                    |                                            |                                                                              |                                            |                                             |                                             |                                                        |
| - output LOW                          | M, I                                   | -                                                                           | -                  | 5.7                                        | I <sub>QL</sub>                                                              | 14.0                                       | 13.2                                        | 12.4                                        | mA                                                     |
| - output forced LOW (wired-OR)        | $\begin{Bmatrix} M \\ I \end{Bmatrix}$ | V <sub>GH</sub><br>V <sub>GL</sub>                                          | V <sub>QLmax</sub> | 6.3                                        | -I <sub>QLL</sub> max.                                                       | 8.7                                        | 8.35                                        | 8.0                                         | mA                                                     |
| <u>Input currents</u>                 |                                        |                                                                             |                    |                                            |                                                                              |                                            |                                             |                                             |                                                        |
| - input LOW                           | M, I                                   | V <sub>QLmax</sub>                                                          | -                  | $\begin{Bmatrix} 5.7 \\ 6.3 \end{Bmatrix}$ | $\begin{Bmatrix} -I_{GL} \text{ max.} \\ -I_{GL} \text{ max.} \end{Bmatrix}$ | $\begin{Bmatrix} 3.3 \\ 3.6 \end{Bmatrix}$ | $\begin{Bmatrix} 2.95 \\ 3.3 \end{Bmatrix}$ | $\begin{Bmatrix} 2.85 \\ 3.2 \end{Bmatrix}$ | $\begin{Bmatrix} \text{mA} \\ \text{mA} \end{Bmatrix}$ |
| - input HIGH                          | M, I                                   | $\begin{Bmatrix} V_{QHmin}; \\ \text{other input} \\ V_G = 0 \end{Bmatrix}$ | -                  | 5.7                                        | I <sub>GH</sub> max.                                                         | 1.0                                        | 1.0                                         | 25                                          | μA                                                     |

**CHARACTERISTICS** (continued)

|                                                                                  | M/I  | sup-<br>ply<br>P(V)                                       | T <sub>amb</sub> (°C)                        |                      |                      |                      |          |
|----------------------------------------------------------------------------------|------|-----------------------------------------------------------|----------------------------------------------|----------------------|----------------------|----------------------|----------|
|                                                                                  |      |                                                           | 0                                            | 25                   | 75                   |                      |          |
| <u>DYNAMIC DATA</u> (see Fig.1 and 2)                                            |      |                                                           |                                              |                      |                      |                      |          |
| <u>Prop. delay reference level</u>                                               | M, I | 6.0                                                       | V <sub>pd</sub>                              | 1.5                  | 1.5                  | 1.5                  | V        |
| <u>Fall propagation delay time</u>                                               |      |                                                           |                                              |                      |                      |                      |          |
| N = 1; C <sub>W</sub> = 40 pF; t <sub>f</sub> = t <sub>r</sub> = 20 ns           | M    | 6.0                                                       | t <sub>pdf</sub> typ.<br>max.                | 90<br>170            | 75<br>130            | 90<br>170            | ns<br>ns |
| <u>Rise propagation delay time</u>                                               |      |                                                           |                                              |                      |                      |                      |          |
| N = 1; C <sub>W</sub> = 40 pF; t <sub>f</sub> = t <sub>r</sub> = 20 ns           | M+I  | 6.0                                                       | t <sub>pdr</sub> typ.<br>max.                | 170<br>280           | 120<br>200           | 170<br>280           | ns<br>ns |
| <u>Output pulse width</u>                                                        |      |                                                           |                                              |                      |                      |                      |          |
| R <sub>t</sub> = 10 kΩ, C <sub>t</sub> = 180 pF<br>(other conditions: see Fig.3) | M    | 6.0                                                       | t <sub>Q1L</sub> typ.                        |                      | 1.0                  |                      | μs       |
| <u>Requirements for proper operation</u>                                         |      |                                                           |                                              |                      |                      |                      |          |
| - timing resistor                                                                | M    | 5.7<br>to 6.3                                             | R <sub>t</sub> min.<br>max.                  | 5<br>10              | 5<br>10              | 5<br>10              | kΩ<br>kΩ |
| - timing capacitor                                                               | M    | 5.7<br>to 6.3                                             | C <sub>t</sub> max.                          | 160                  | 160                  | 160                  | μF       |
| - duration coincidence of input<br>HIGH and output HIGH                          |      |                                                           |                                              |                      |                      |                      |          |
| a) t <sub>Q1L</sub> dependent on input<br>waveform                               | M    | 5.7<br>to 6.3                                             | t <sub>GQH</sub> min.                        | $\frac{t_{Q1L}}{10}$ | $\frac{t_{Q1L}}{10}$ | $\frac{t_{Q1L}}{10}$ |          |
| b) t <sub>Q1L</sub> independent of input<br>waveform                             | M    | 5.7<br>to 6.3                                             | t <sub>GQH</sub> min.                        | $\frac{t_{Q1L}}{2}$  | $\frac{t_{Q1L}}{2}$  | $\frac{t_{Q1L}}{2}$  |          |
| - duration input LOW                                                             | M    | 5.7<br>to 6.3                                             | t <sub>GL</sub> min.                         | 30                   | 30                   | 30                   | ns       |
| - (t <sub>1</sub> -t <sub>2</sub> ) for ringing-free<br>operation (see Fig.2)    | M    | 5.7<br>to 6.3                                             | (t <sub>1</sub> -t <sub>2</sub> ) min.       | 0                    | 0                    | 0                    |          |
| <u>SUPPLY</u>                                                                    |      |                                                           |                                              |                      |                      |                      |          |
| <u>Supply current</u>                                                            |      |                                                           |                                              |                      |                      |                      |          |
| - output Q <sub>1</sub> HIGH (quiescent state)                                   | M+I  | $\left\{ \begin{array}{l} 6.0 \\ 6.3 \end{array} \right.$ | I <sub>PH</sub> typ.<br>I <sub>PH</sub> max. | 18.5<br>26.5         | 17.5<br>24           | 16<br>23             | mA<br>mA |
| - output Q <sub>1</sub> LOW                                                      | M+I  | 6.0                                                       | I <sub>PL</sub> typ.                         | 20                   | 19                   | 17.5                 | mA       |

## CHARACTERISTICS (continued)

|                                                                                                                                                               |           |                  | T <sub>amb</sub> (°C) |     |     |         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------|-----------------------|-----|-----|---------|
|                                                                                                                                                               | M/I       | supply<br>P (V)  |                       | 0   | 25  | 75      |
| <u>DERIVED DATA</u>                                                                                                                                           |           |                  |                       |     |     |         |
| Available d.c. fan-out (to similar circuits)<br>(uniform system supply voltage)                                                                               | M, I      | 5.7<br>to<br>6.3 | N <sub>a</sub> min.   | 4   | 4   | 4       |
| D.C. noise margin LOW (related to<br>similar circuits)                                                                                                        | M, I      | 5.7              | M <sub>L</sub> min.   | 0.6 | 0.6 | 0.4 V   |
| → <u>A.C. noise margin <sup>1)</sup></u>                                                                                                                      |           |                  |                       |     |     |         |
| <u>Max. operating frequency</u>                                                                                                                               |           |                  |                       |     |     |         |
| { N = 1; C <sub>W</sub> = 40 pF; t <sub>f</sub> = t <sub>r</sub> = 20 ns;<br>→ { t <sub>Q1L</sub> = 100 ns; t <sub>GQH</sub> = 50 ns; t <sub>GL</sub> = 40 ns | {M<br>M+I | 5.7<br>to<br>6.3 | f <sub>c</sub> min.   | 2.0 | 2.5 | 2.0 MHz |
| <u>Power supply consumption</u>                                                                                                                               |           |                  |                       |     |     |         |
| - Q <sub>1</sub> HIGH (quiescent state)                                                                                                                       | M+I       | 6.0              | P <sub>H</sub> typ.   | 110 | 105 | 95 mW   |
| - Q <sub>1</sub> LOW                                                                                                                                          | M+I       | 6.0              | P <sub>L</sub> typ.   | 120 | 115 | 105 mW  |
| - 50% duty cycle                                                                                                                                              | M+I       | 6.0              | P <sub>av</sub> typ.  | 115 | 110 | 100 mW  |

→ <sup>1)</sup> The noise margin for a.c. disturbances at the trigger inputs G<sub>1</sub> and G<sub>2</sub> can be increased by connecting a capacitor between pin 6 and pin 5, with some reduction of max. operating frequency.

Fig.1. Dynamic characteristics: measurement setup.

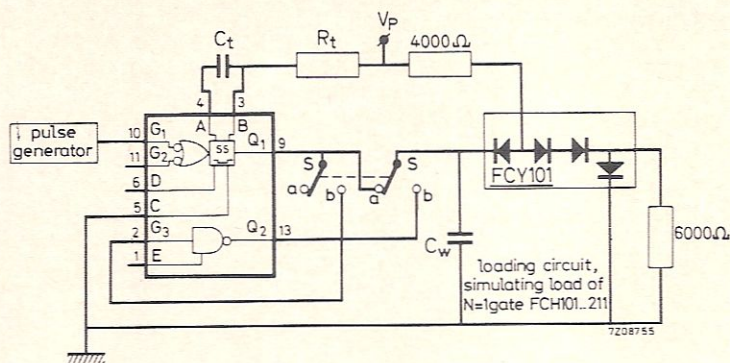
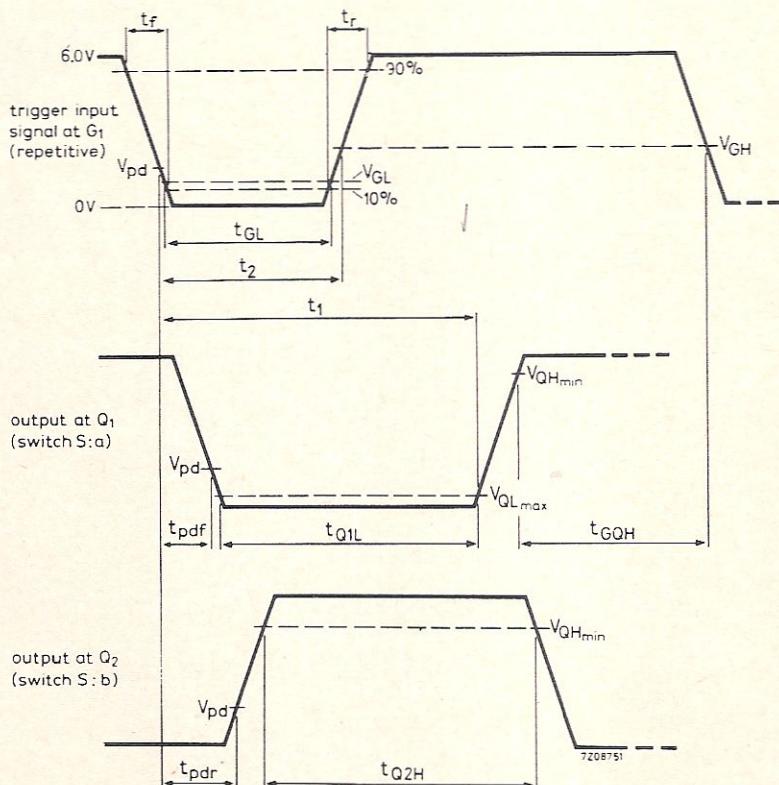


Fig.2. Dynamic characteristics: waveforms and definitions.



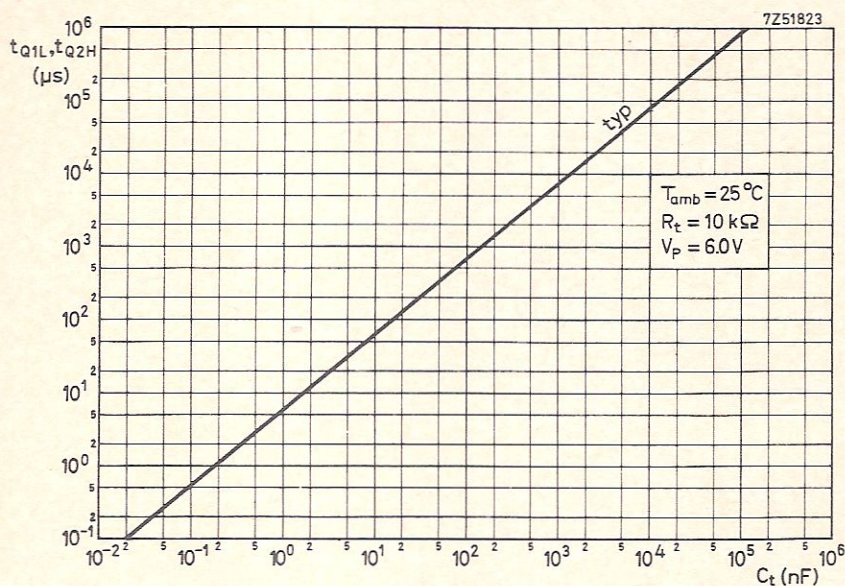


fig.3 output pulse width versus  $C_t$

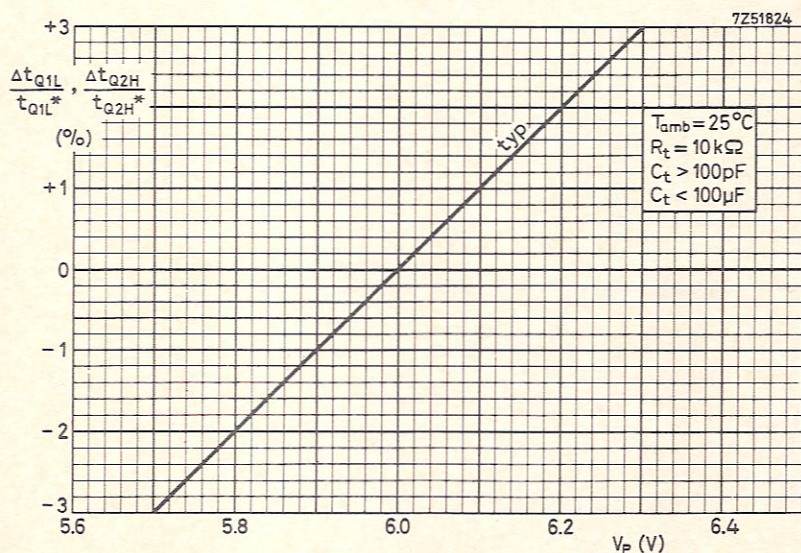


fig.4 relative change of output pulse width versus  $V_P$

\* $V_P = 6.0 V$

**ADDITIONAL SYSTEM DESIGN DATA**

Fan-out and noise margins related to NAND gates FCH101...211

|                                                                     | M/I           | sup-<br>ply<br>P (V) |                     | T <sub>amb</sub> (°C) |     |     |   |
|---------------------------------------------------------------------|---------------|----------------------|---------------------|-----------------------|-----|-----|---|
|                                                                     |               |                      |                     | 0                     | 25  | 75  |   |
| <u>Available d.c. fan-out (uni-<br/>form system supply voltage)</u> |               |                      |                     |                       |     |     |   |
| - gate to FCK101's                                                  | M, I          | 5.7<br>to 6.3        | N <sub>a</sub> min. | 4                     | 4   | 4   |   |
| - FCK101 to gates                                                   | M, I          | 5.7<br>to 6.3        | N <sub>a</sub> min. | 8                     | 8   | 8   |   |
| <u>D.C. noise margins</u>                                           |               |                      |                     |                       |     |     |   |
| - gate to FCK101                                                    | { LOW<br>HIGH | M, I                 | M <sub>L</sub> min. | 0.6                   | 0.6 | 0.4 | V |
|                                                                     |               | M, I                 | M <sub>H</sub> min. | 2.9                   | 3.0 | 2.5 | V |
| - FCK101 to gate                                                    | LOW           | M, I                 | M <sub>L</sub> min. | 0.6                   | 0.6 | 0.4 | V |

**RATINGS** (Limiting values)<sup>1)</sup>

|                               |                  |                |          |
|-------------------------------|------------------|----------------|----------|
| Supply voltage                | V <sub>P</sub>   | max.           | 8 V      |
| Output voltage                | V <sub>Q</sub>   | 0 to 8 V       |          |
| Input voltage                 | V <sub>G</sub>   | max.           | 8 V      |
| Negative input current        | -I <sub>G</sub>  | max.           | 20 mA *) |
| Storage temperature           | T <sub>stg</sub> | -35 to +125 °C |          |
| Operating ambient temperature | T <sub>amb</sub> | 0 to 75 °C     |          |

\*) At this limit -V<sub>G</sub> typ. 1.5 V

<sup>1)</sup> Limiting values according to the Absolute Maximum System as defined in IEC publication 134.

**FCK 101**

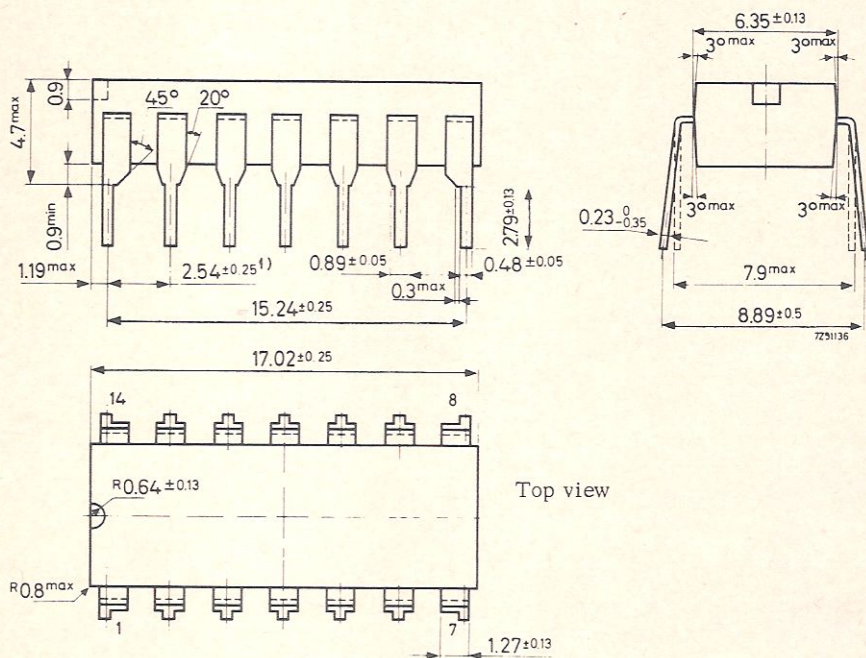
(Monostable)

**FC family**

standard temperature range

## → PACKAGE OUTLINE

Dimensions in mm



<sup>1)</sup> Tolerance non-cumulative.